UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

# Geologic Map of the Lund Quadrangle, Iron County, Utah

By

S. Kerry Grant and Myron G. Best

Open-File Report 79-1655
1979

## DESCRIPTION OF MAP UNITS

Qac — ALLUVIUM AND COLLUVIUM (QUATERNARY)--Unconsolidated, poorly sorted stream, fan, slope-wash, and playa deposits of gravel, sand, silt, and clay; includes small exposures of older alluvium. Less than 100 m thick on the eastern flank of the range, but thickens beneath the Escalante Desert

OTa — ALLUVIUM AND LAVAS (PLEISTOCENE, PLIOCENE, AND MIOCENE)--Weakly consolidated, pale-orange-gray sandstone and pebble to boulder conglomerate of alluvial origin, and flows and feeder dikes of medium-gray olivine basalt(?) and dark brown-gray rhyodacite. Clasts in the conglomerate are dark volcanic rock and a variety of Mesozoic and Paleozoic sedimentary rocks. Thickness at least 150 m

FORMATION OF BLAWN WASH (MIOCENE)--Chiefly rhyolite tuffs and lava flows named for exposures near Blawn Wash northwest of the Lund Quadrangle

Tbt — Tuff member--Pink to pale-yellow and orange, weakly to moderately welded lithic ash-flow tuffs. At Broze Knoll the upper part of the member consists of at least two tuffs of differing lithic content. The upper tuff contains abundant lithic fragments as large as 10 cm in diameter of brown-gray flow-foliated rhyolite containing sanidine, plagioclase, and biotite. A sandstone unit of possible base-surge origin, less than one meter thick separates the upper tuff from an underlying tuff that contains only a few percent lithic fragments. Both tuffs contain 10-15 percent phenocrysts of plagioclase, sanidine, quartz, biotite, and a trace of sphene. The tuffs at Broze Knoll are a 25 m-thick sequence of epiclastic volcanic sediments filling a channel cut into the underlying tuff of Leigh Well. The upper half of this sequence consists of interbedded cream-colored sandstone and siltstone with minor pumice-rich conglomerate; the lower half is a tan pebble conglomerate with brown, red, and green volcanic clasts. Total thickness of the unit is more than 100 m

Tlw — TUFF OF LEIGH WELL (MIOCENE)--Rust, pale-orange to pink, moderately to weakly welded, ledge-forming ash-flow tuff. A dark olive-gray basal vitrophyre contains abundant lithic fragments as much as 8 cm long of dark volcanic rocks including hornblende andesite of the unit Tha. Phenocrysts comprise 10-20 percent of the tuff with plagioclase predominating in the lower half of the unit and sanidine more abundant near the top; biotite is present throughout. Thickness on the west flank of Broze Knoll is 20 m but the unit thins westward where it is included within the unit Tbt

Tha — HORNBLENDE ANDESITE FLOW (OLIGOCENE)--Reddish-gray flow-foliated lava with conspicuous needles of hornblende. At least 100 m thick

Ti

ISOM FORMATION (OLIGOCENE)--Red and purple densely welded vitric ash-flow tuffs and a lava flow. Tuffs contain 5-10 percent phenocrysts of plagioclase and traces of altered pyroxene. The lava flow has a basal black vitrophyre and contains larger and more abundant phenocrysts of plagioclase and pyroxene. Stretched vesicles are alined between N. 40° W. and N. 70° W. Collapsed pumice lapilli in the tuffs are generally porous; in one of the lower tuffs vesicles or pumice voids have been completely filled with calcite and other milky white secondary minerals. Matrix of the tuffs and lava flow ranges from massive to strongly foliated with flow folds common. Unit weathers to plates and grus. Thickness ranges from 100 m in the north to more than 150 m in the south. Age, 25 m.y. (Fleck and others, 1975)

NEEDLES RANGE FORMATION (OLIGOCENE)--Sheets of densely to moderately welded, crystal-rich ash-flow tuffs. The Needles Range can be divided into mappable parts over most of its extent, and should be assigned to higher stratigraphic rank. Age, 29 m.y. (Fleck and others, 1975)

Tl

Lund Tuff Member--A single cooling unit 300-400 m thick of red, brown, to pink tuff containing 30-45 percent phenocrysts of mainly plagioclase, with lesser quartz and biotite, inconspicuous hornblende, and traces of sanidine, sphene, and pyroxene. The quartz is conspicuous and ranges widely in abundance and size, but a few grains larger than 2 mm diameter are present almost everywhere. Pumice is most distinct toward the top of the unit where a few brown lithic fragments also occur. Plagioclase and hornblende are slightly more abundant in the middle third of the unit. A basal vitrophyre is exposed only in the northwest part of the quadrangle. Included in the unit below the tuff is an underlying complex of gray crystal-poor ash-flow tuff, volcanic sandstone interbedded with the tuff, and dark-brown lavas of intermediate composition; this complex is thickest in the southern part of the quadrangle where it approaches 100 m

Tw

Wah Wah Springs Tuff Member (Oligocene)--A single cooling unit of ash-flow that ranges from light gray at the top to red at the base and contains 25-50 percent phenocrysts of mainly plagioclase, with lesser hornblende and biotite, inconspicuous quartz, and a trace of pyroxene. The top of the cooling unit has the least crystals and the middle the most. Hornblende is nearly absent from the uppermost tuff which has small dark lithic fragments. Quartz grains do not exceed 2 mm in diameter. Vitrophyre is present at the base. A three-meter bleached and fractured zone occurs near the middle of the unit in the south. Total thickness ranges from 250 m in the south to 120 m in the north where it overlies the rhyolite unit (Ter)

ESCALANTE DESERT FORMATION (OLIGOCENE)--Unit named by Grant (1978)

Ter

Rhyolite member--Striped red and light-gray flow-foliated rhyolite containing 5 percent phenocrysts of chalky feldspar and minor hornblende and biotite. Isoclinally flow folded in the upper half with gently inclined north-south axes on folds of eastward vergence and steep east-west axes and axial planes on another set. Flow layers are parallel to the base of the flow in the lower half. Flow breccia occurs at the base. Almost 200 m thick

Tea

Andesite flow and dikes member--Dark-gray, massive to vesicular lava flow as much as 50 m thick with fine-grained phenocrysts of plagioclase and pyroxene. Dark-gray, weakly resistant dikes are 5-15 m wide between ribs of resistant baked host rock; ranges from massive aphanitic to vesicular with calcite filling elongate tubular cavities

Tet

Tuff member--Sequence of crystal-poor lithic-rich ash-flow tuffs and minor volcaniclastic deposits. The uppermost tuff cooling unit has 9-19 percent phenocrysts mainly of plagioclase with some hornblende and biotite; volcanic fragments constitute 5-10 percent of this unit with the higher concentrations at the base; the color ranges from pink-gray at the top through red-brown to black in a basal vitrophyre; thickness is 21 m in sec. 6, T. 32 S., R. 14 W., but it is absent where the rhyolite member (Ter) is thick. The underlying tuff cooling unit is lithologically similar, but is thicker (87 m), has traces of quartz and sanidine, has an orange basal vitrophyre with considerable red-gray moderately welded tuff below the vitrophyre, and hornblende is confined to the vitrophyre and the tuff below it; this tuff is also thin to absent in the vicinity of the rhyolite member (Ter).

Older tuffs in the sequence have only 2-6 percent phenocrysts of plagioclase and quartz and a trace of biotite. From the top down these tuffs are pink gray to light orange brown, light gray and green gray. They have as much as 12 percent lithic fragments which are more abundant at the base and increase in size to as much as 6 cm across toward Marsden Spring where they are of volcanic rock and pink, red, and purple quartzite and green phyllite. Thickness is 78 m in the southeast, increasing westward to more than 150 m at Marsden Spring.

A basal tuff, about 10 m thick, occurs in the north half of the quadrangle; it is red-purple to gray and has as much as 20 percent crystals of plagioclase, quartz, and biotite.

Volcaniclastic beds occur between the ash-flow sheets and decrease in thickness and size of clasts downward in the unit; the top bed is 20 m thick and consists of volcanic conglomerate with boulders approaching two meters in diameter. The basal bed consists of reversely graded volcanic sandstone 6 cm thick

Tt — ASH-FLOW TUFF (OLIGOCENE)--Green, red, and gray densely welded but weakly resistant tuff with 25-30 percent phenocrysts of plagioclase and quartz, minor biotite, and traces of sanidine and hornblende. Quartz is in large grains more than 3 mm in diameter that are locally euhedral in pumice fragments; biotite is warped and conspicuous even where the flakes are as little as 0.1 mm across. Sheeting fractures along or at a low angle to the compaction foliation are pervasive. Lithic fragments as large as 15 cm across occur at the base and include a quartz-rich volcanic rock and some carbonate rocks. As much as 200 m thick in places, but absent in the south

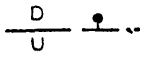
Tc — CONGLOMERATE (OLIGOCENE, EOCENE OR PALEOCENE)--Red to brown, weakly resistant cobble to boulder conglomerate. Clasts and matrix are predominantly of volcanic rocks with sparse poorly exposed lava flows at the top, through quartzites in the middle, to predominantly carbonate rocks at the base; clasts are as large as 1 m in diameter, but are generally much smaller. Thickness ranges from a few tens of meters to as much as 150 m

JTr n — NAVAJO SANDSTONE (LOWER JURASSIC AND UPPER TRIASSIC)--The upper part is a resistant, uniform, red sandstone with concretions 2 cm in diameter and large-scale crossbeds that suggest a source to the northwest; partially silicified where cut by a thrust fault. The lower part is coarse cross-laminated sandstone and pebble conglomerate 10-20 m thick, possibly equivalent to the Shinarump Conglomerate. Poorly exposed red siltstone between the upper and lower parts of the unit may be equivalent to the Chinle Formation. Overall thickness of the unit exceeds 500 m

Cm — CAMBRIAN CARBONATE ROCKS, UNDIVIDED (MIDDLE(?) CAMBRIAN)--Moderately resistant, mottled dark and light gray or slate gray and buff carbonate. Occurs in one large outcrop near Marsden Spring where it is in thrust fault contact with underlying Mesozoic sandstone

EXPLANATION OF SYMBOLS


CONTACT--Dashed where inferred or approximately located



FAULT--Dashed where inferred or schematically located; dotted where concealed. Ball and bar, or D, on downthrown side


LOW-ANGLE DENUDATION FAULT--Teeth on upper plate


THRUST FAULT--Teeth on upper plate

STRIKE AND DIP OF BEDDING

STRIKE AND DIP OF COMPACTION FOLIATION IN ASH-FLOW TUFFS

STRIKE AND DIP OF FLOW LAYERING IN LAVAS AND REMOBILIZED TUFFS

Inclined


Vertical


EROSIONAL SCARP--Probably an ancient lake shoreline

## REFERENCES


Best, M. G., Shuey, R. T., Caskey, C. F., and Grant, S. K., 1973, Stratigraphic relations of members of the Needles Range Formation at type localities in southwestern Utah: Geological Society of America Bulletin, v. 84, p. 3269-3278.

Campbell, D. R., 1978, Stratigraphy of pre-Needles Range Formation ash-flow tuffs in the northern Needle Range and southern Wah Wah Mountains, Beaver County, Utah: Brigham Young University Geology Studies, v. 25, p. 31-46.

Dinkel, T. R., 1969, Vertical and lateral variations in a welded tuff: Rolla, University of Missouri, unpublished M.S. thesis, 58 p.

Fleck, R. J., Anderson, J. J., and Rowley, P. D., 1975, Chronology of mid-Tertiary volcanism in High Plateaus region of Utah: Geological Society of America Special Paper 160, p. 53-61.

Grant, S. K., 1978, Stratigraphic relations of the Escalante Desert Formation near Lund, Utah: Brigham Young University Geology Studies, v. 25, p. 27-30.

Kreider, J. E., 1970, The Lund ash-flow tuff: Rolla, University of Missouri, unpublished M.S. thesis, 73 p.

Miller, G. M., 1966, Structure and stratigraphy of southern part of Wah Wah Mountains, southwest Utah: American Association of Petroleum Geologists Bulletin, v. 50, p. 858-900.